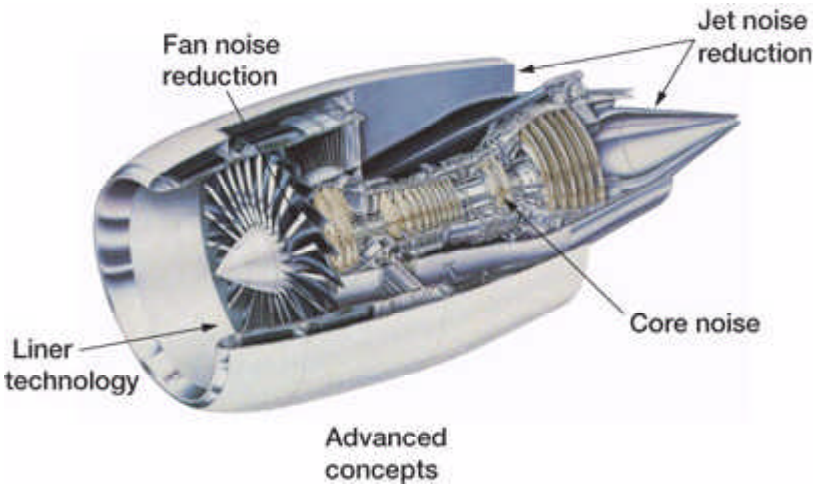
Critical Low-Noise Technologies Being Developed for Engine Noise Reduction Systems Subproject

NASA's previous Advanced Subsonic Technology (AST) Noise Reduction Program delivered the initial technologies for meeting a 10-year goal of a 10-dB reduction in total aircraft system noise. Technology Readiness Levels achieved for the engine-noise-reduction technologies ranged from 4 (rig scale) to 6 (engine demonstration). The current Quiet Aircraft Technology (QAT) project is building on those AST accomplishments to achieve the additional noise reduction needed to meet the Aerospace Technology Enterprise's 10-year goal, again validated through a combination of laboratory rig and engine demonstration tests.

In order to meet the Aerospace Technology Enterprise goal for future aircraft of a 50-reduction in the perceived noise level, reductions of 4 dB are needed in both fan and jet noise. The primary objectives of the Engine Noise Reduction Systems (ENRS) subproject are, therefore, to develop technologies to reduce both fan and jet noise by 4 dB, to demonstrate these technologies in engine tests, and to develop and experimentally validate Computational Aero Acoustics (CAA) computer codes that will improve our ability to predict engine noise.

The ENRS subproject previously identified candidate fan- and jet-noise-reduction technologies with the potential to meet the QAT goal for engine noise reduction. ENRS is currently in a design-build-test phase that will culminate in engine (TRL 6) validation of these technologies in fiscal years 2006 to 2007, during which the noise-reduction benefit of each concept will be measured. In parallel with the development of noise-reduction technologies, more basic research is being conducted to understand the physics of engine noise sources. This work includes fan and jet source diagnostic tests as well as the development and application of advanced measurement technologies to characterize the flow fields in and around these components. These observations will be used to explain the physical mechanisms of dominant engine noise sources, and the test data will be used to validate CAA codes under development to predict fan and jet noise with increased accuracy and computational efficiency.

The ENRS subproject is organized into the five elements shown in the figure. The subproject includes research efforts at the NASA Glenn Research Center, the NASA Langley Research Center, and a number of universities and small businesses. The technologies under development will be accomplished in collaboration with GE Aircraft Engines, Pratt & Whitney, Honeywell, and Rolls Royce.



High-bypass-ratio turbofan engine cutaway showing the technology elements being pursued under the Engine Noise Reduction Systems (ENRS) subproject of the QAT project.
The five technology elements being pursued are fan noise reduction, jet noise reduction, core noise, liner technology, and advanced concepts.

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